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An analysis of the mammalian levogram. By Thomas Lewis[1]. (*Preliminary Communication.*)

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In a recent preliminary communication (*Proc. Physiol. Soc.*, March 13, 1915) I described the axial electrocardiogram of the dog as consisting of the algebraically summated effects of the right and left ventricles; terming the two curves which go to form the combined electrocardiogram (or bigram) dextrogram and levogram respectively, and pointing out that the further analysis of the initial phases of the bigram should comprise separate analyses of the two curves of which it is a composite.

I have now analysed the levogram, using Einthoven's method of determining the electrical axis of the heart and studying its rotation. While the initial phases of the levogram are written, the electrical axis moves in the dog in an anticlockwise fashion, the movement being practically uninterrupted in this direction. To take an example and considering the angle formed with a base line passing through the two shoulders, the angle is at first 150°; it passes through 254° ending at −104° (Fig. 1).

Believing that the electrical axis gives the average direction in which the excitation process is moving, I attribute the change of axis to a corresponding change in the direction in which the excitatory process progresses.

The change in direction indicates that the excitation wave on the left side first flows from left to right and perhaps upwards in the upper part of the septum; later from left to right and downwards in the lower septum; later from above downwards and to the left at the apex and in the lower parts of the lateral wall; and lastly from below upwards in the upper parts of the lateral wall. This change, and the distribution suggested, is remarkably consistent with the surface readings of the excitatory process, obtained by Rothschild and myself and with our hypothesis that the excitation wave travels away radially from the Purkinje network.

[1] Working under the Medical Research Committee.

The statement of Rothberger and Winterberg (*Zeitschrift f. Herz- u. Gefässkrank.* v. 206. 1913) that the levogram has its chief phase in the downward direction in leads I and III in the dog is not universally true. It is true in some instances, and when this arrangement of the deflections obtains, the electrical axis is rotated very rapidly across the line of 0° (Fig. 1). In a monkey, in which animal there are no strands of Purkinje substance bridging the cavity, the

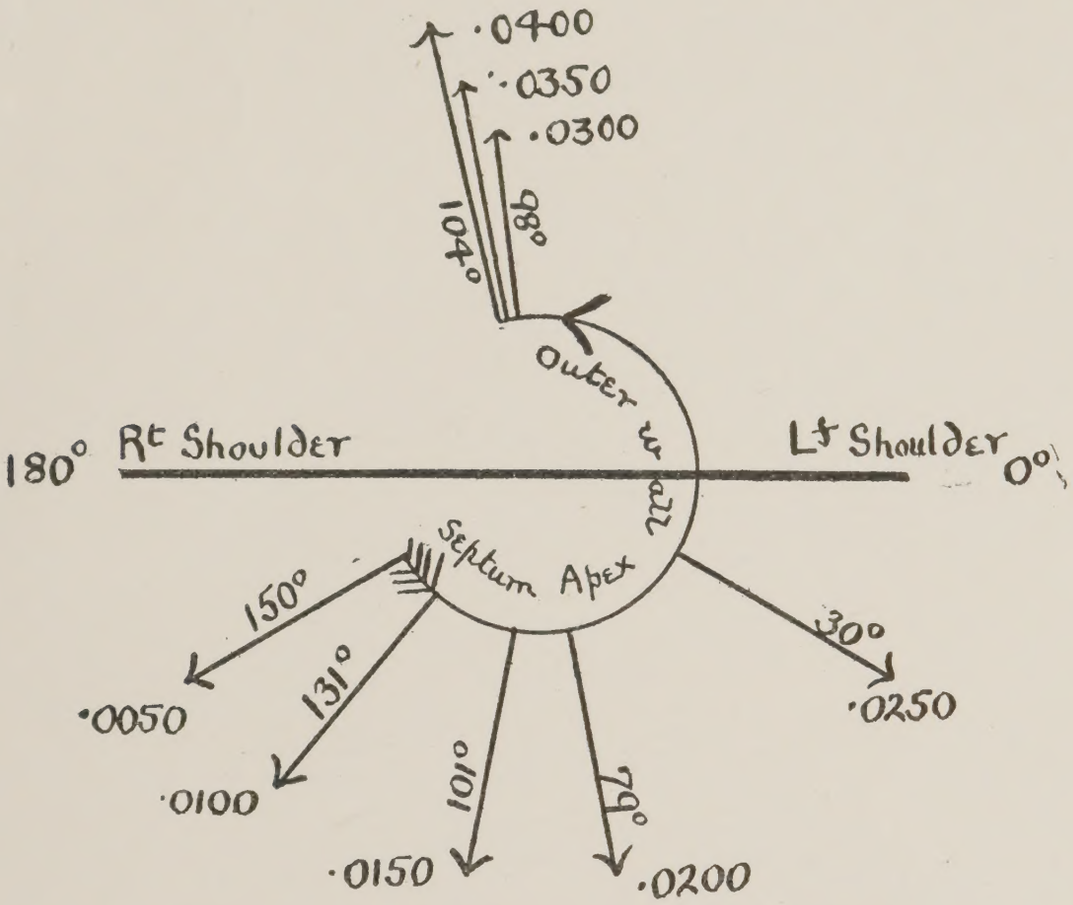

Fig. 1. A diagram showing the anticlockwise movement of the electrical axis when the left ventricle passes into a state of activity. The horizontal figures represent the times in seconds, subsequent to the first appearance of the excitation current. From a dog.

The diagram may be held to represent also the distribution of the excitation wave in the left ventricle.

levograms of leads I and III showed chief deflections in directions opposite to each other; the anticlockwise rotation of the axis was remarkably uniform, and the curves as a whole presented the closest resemblance to those which are held to represent damage of the right bundle branch in the human subject. The last-named curves, when analysed, demonstrate a similar and very uniform anticlockwise rotation of the electrical axis through much the same angles.

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